# CLAIMS

1) A method for determining the composition of a substantially homogeneous fluid, wherein the following stages are carried out :

a) measuring the attenuation and the phase shift of at least two wave beams that have travelled paths of different distances in said fluid,

b) determining relations modelling the variations of the attenuation and phase shift of the waves as a function of the distance, measured in stage a),

c) determining the composition of the fluid by comparing the relations determined in stage b) with a set of previously determined relations, each relation of said set corresponding to a fluid of known composition.

2) A method as claimed in claim 1, wherein in stage a), at least two of said wave beams have travelled two different paths of equal distance in said fluid and wherein a mean of the attenuations and of the phase shift measured for said at least two beams that have travelled two different paths of equal distance in said fluid is worked out.

3) A method as claimed in claim 2, wherein said mean is a weighted mean.

4) A method as claimed in claim 1, wherein in stage c), the set of previously determined relations is obtained by carrying out stages a) and b) on fluids of known composition.

5) A method as claimed in claim 1, wherein in stage b), a first equation of the attenuation as a function of the distance and a second equation of the phase shift as a

function of the distance are determined, the first and second equations approaching the attenuation and phase shift measurements of stage a), and

wherein in stage c), the composition of the fluid is determined by comparing the first and second equations determined in stage b) with pairs of previously determined equations, each pair of equations corresponding to a fluid of known composition.

6) A method as claimed in claim 5, wherein in stage b), said first equation is of the form $\rho = e^{-\alpha\theta-\alpha_0}$, said second equation is of the form $\theta = \lambda d + \lambda_0$, $\rho$ being the attenuation, $\theta$ being the phase shift, $\alpha$, $\alpha_0$, $\lambda$ and $\lambda_0$ being constants, and wherein the values of constants $\alpha$, $\alpha_0$, $\lambda$ and $\lambda_0$ are determined, and

wherein in stage c), the values of the constants determined in stage b) are compared with groups of previously determined constants, each group of constants corresponding to a fluid of known composition, said groups of previously determined constants being obtained by carrying out stages a) and b) on fluids of known composition.

7) A method as claimed in claim 6, wherein in stage b), linear regression is used to determine the values of the constants.

8) A method as claimed in claim 1, wherein in stage c), at least one of the following conditions : pressure of said fluid, temperature of said fluid and salinity of said fluid, is taken into account.

9) A method as claimed in claim 1, wherein in stage c), the composition of the fluid is determined by selecting in the set of previously determined relations those which best match the relations obtained in stage b).

10) A method as claimed in claim 1, wherein in stage c), a model allowing to assign a known composition to relations modelling the variations of the attenuation and phase shift as a function of the distance is used, the model being constructed by means of the set of previously determined relations.

11) A method as claimed in claim 10, wherein said model is a statistical model or a behavioural model, the model being a polynomial function or a neural network.

12) A method as claimed in claim 1, wherein said wave beams are microwave beams.

13) A method for determining the composition of a fluid contained in a volume, said fluid comprising at least two phases in stratified layers, wherein the following stages are carried out :

a) defining several sections that divide said volume, each section comprising a part of said fluid,

b) measuring the attenuation and the phase shift of a microwave beam that has travelled a path in a first one of said sections,

c) determining the composition of the part of said fluid located in said first section by comparing the attenuation and the phase shift measured in stage b) with a set of pairs of previously determined attenuation and phase shift values, each pair of said set characterizing a fluid of known composition,

d) repeating stages b) and c) for each section defined in stage a),

e) determining the position of said layers from the compositions determined in stage c) and from the definition of the sections in stage a),

f) measuring the attenuation and the phase shift of at least two wave beams that have travelled paths of different distances in a first one of said layers,

g) determining relations modelling the wave attenuation and phase shift variations as a function of the distance, measured in stage f),

h) determining the composition of the fluid forming the first layer by comparing the relations determined in stage g) with a set of previously determined relations, each relation of said set corresponding to a fluid of known composition.

14) A method as claimed in claim 13, wherein the sections defined in stage a) are superposed and separated by parallel planes.

15) A method as claimed in claim 13, wherein in stage c), at least one of the following conditions : pressure, temperature and salinity of said fluid, is taken into account.

16) A method as claimed in claim 13, wherein in stage c), a model allowing to assign a composition to a family of values measured in stage b) is used, the model being constructed from said set of families of values.

17) A method as claimed in claim 16, wherein a statistical model or a behavioural model of linear, quadratic and neural network type is used, and a regression of linear, PLS or neural network type is used.

18) A method as claimed in claim 17, wherein the fluid is a petroleum effluent comprising water, oil and gas, and wherein the model carries out operation 1 : the family of values is classified by discriminant analysis in one of the following categories: water single-phase, oil single-phase, gas single-phase or multiphase,

if the family of values is classified in a single-phase category, then the composition of the effluent is determined,

if the family of values is classified in the multiphase category, operations 2 and 3 are carried out :

Operation 2 : the family of values is classified in a subcategory corresponding to a fluid comprising a phase in a proportion contained in a fixed interval within [0%; 100%],

Operation 3 : the proportion of the phase corresponding to the subcategory is determined by regression on the fixed interval.